RSAC ASCAP TUTORIAL

ABSTRACT

A one day ASCAP Design for Safety Assessment Tutorial will be presented on Tuesday, March 4, 2003 at Philadelphia. It is based on selected information taken from the IDOT Base Case lessons learned and IDOT "Peer Review" activities. The Tutorial will be given at the upcoming Philadelphia RSAC meeting. The central purpose of the tutorial will be to demonstrate that ASCAP is compliant to the Processor-based Regulatory Rule as a competent methodology. The overall architecture and its detailed safety-critical models will be presented with an emphasis on the features of each of the safety models that are supported by the ASCAP architecture, the data required for a design for safety assessment and the credible safety evidences obtained from ASCAP. The ASCAP architecture is based on a Monte Carlo methodology implemented as a hybrid simulation: discrete event and continuous. The objective of the ASCAP architecture is to remain very close to the product safety design process as specified by the Processor-based Regulatory Rule Product Safety Plan (PSP).

The tutorial approach will start with the Train Movement String Charts used for the IDOT Base Case that determine the Risk versus Train Miles exposure and describe A *Day in the Safety of a Train System* by moving two trains for a day. One train moves from Chicago to St, Louis and the other train from St. Louis to Bloomington/Normal. As each of the trains are moved, they intersect with wayside, track infrastructure and on-board Cab Signaling safety appliances, all called objects, where the safety state of the train system is determined: (1) operational, (2) fail-safe and (3) fail-unsafe. The objects interact with the Dispatcher, Train Crews and Roadway Workers, called agents, to determine the Compliance or non Compliance states to the Operational Rule Book of the IDOT territory. The Rule Book is stored in the Working Memory of an Expert System Knowledge-based Black Board that transforms the train system probabilistic behavior to train handling modality outcomes. The Black Board concept is taken from the Artificial Intelligence community. It is illustrated in detail with IDOT Base Case lessons learned.

An advanced methodology called A Choice Model Knowledge-based Black Board, currently under development, is compared to the IDOT Base Case Knowledge-based Black Board. The goal of the Choice Model is to remove limitations in obtaining the probabilistic behavior of the Agents. The Choice Model methodology makes extensive use of the physics of train movement scheduling and handling to develop Agent behavior as related to the Operations Rule Book Compliance or Non Compliance. A Monte Carlo methodology determines the Black Board consequences based on the train handling action probabilities estimated by the Choice Model. The Choice Model methodology is illustrated with an example.

Finally, typical results are presented as processed with the aid of a Parallel Processing Cluster Computer. The Cluster Computer is being interfaced as a WEB-based tool set that will be available to the Center staff and world-wide with the Center China and Germany collaboration. Use of the Cluster computer is illustrated with an example.

Dr. Ted C. Giras
February 25, 2003